

REMARKS

Claims 1-3 and 5-7 are currently pending in this application. By this response to the non-final Office Action mailed on May 13, 2009, claims 1, 5, and 6 are amended, new claim 7 is added, and claim 4 is canceled without prejudice. Support for the amendments is found in the specification, including the claims, as originally filed. No new matter has been introduced. Favorable reconsideration of the application in light of the foregoing amendments and following comments is respectfully solicited.

In section 3 of the Office Action, claims 1, 2, 5, and 6 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent App. Pub. No. 2003/0231672 (Komoto). Claims 3 and 4 were rejected under 35 U.S.C. § 103(a) as being obvious over Komoto in view of U.S. Patent No. 7,009,919 (Matsuda). Applicants respectfully traverse.

Claim 1

In conventional two-beam devices, such as those shown in FIGS. 6 and 7 of this application, FIG. 3 of Matsuda, and 1A, 1C, 3A, and 3B of Komoto, “for better heat dissipation and easy wire bonding, the submount [is] formed far larger than the semiconductor element” (paragraph [0031] of U.S. Patent App. Pub. No. 2006/0285476, the publication corresponding to this application). As shown in FIGS. 6 and 7 of this application, conventional devices bonded wires to a substrate on each side of a two-beam laser element mounted on the substrate. As noted in paragraph [0035] of the publication corresponding to this application, “[t]his makes the submount 63 unduly wide, which makes it more difficult to miniaturize the two-beam semiconductor laser device 50.”

In contrast, amended claim 1 recites, *inter alia*, a two-beam semiconductor laser device:

wherein no photodetector is provided on the submount,
wherein the first and second electrode pads are formed to extend farther
behind the two-beam semiconductor laser element, and are wire-bonded behind
the two-beam semiconductor laser element, and
wherein a lateral width of the submount along the front part of the
submount is 400 μm or more but 700 μm or less.

To clarify the claimed subject matter, amended claim 1 recites, *inter alia*, “a **lateral width of the submount along the front part of the submount** is 400 μm or more but 700 μm or less.” FIG. 2 of this application illustrates a non-limiting example with “lateral length W of the submount 63 far smaller than in the conventional example shown in FIG. 7” (paragraph [0106] of the publication corresponding to this application). As explained by this application, embodiments of the above limitations are narrower and more compact devices better suited for high-frequency modulation than conventional devices. Paragraph [0042] of the publication corresponding to this application describes advantages associated with the recited “lateral width of the submount along the front part of the submount [being] 400 μm or more but 700 μm or less.”

Section 11 of the Office Action, directed to claim 4 as previously presented, acknowledges that Komoto does not disclose “wherein a lateral length of the submount is 400 micron or more but 700 micron of less” (Office Action, page 4). Although Komoto does not expressly describe dimensions for particular features, in FIGS. 1A and 1C, for example, it is readily apparent that substrate 6 is significantly wider than the laser element 3 mounted thereon.

Seeking to bridge the acknowledged gap between Komoto and the claimed subject matter, the Office Action seeks to rely upon Matsuda. As noted by the Examiner, with respect to the device illustrated in FIGS. 2 and 3 of Matsuda, Matsuda discloses “a GaAs substrate 31 with an outer size of the order of $300\mu\text{m}\times 400\mu\text{m}\times 100\text{--}120\mu\text{m}$,” upon which two laser elements are stacked and “spaced about 100 μm apart” (col. 7, lines 1-18). Matsuda is not clear as to which

dimension corresponds to the width of the substrate 31. However, even assuming a width of 300 μm for substrate 31, Matsuda, FIG. 3 shows the conventional practice of employing a submount far larger than the laser element, and accordingly silicon wafer 44 in Matsuda does not disclose or suggest a device in which “a lateral width of the submount along the front part of the submount is 400 μm or more but 700 μm or less,” as recited in claim 1.

It would not have been obvious to modify the Matsuda device to reduce the width of silicon wafer 44 to be “400 μm or more but 700 μm or less,” as recited in claim 1. MPEP § 2144.05(II)(B) (entitled “Only Result-Effective Variables Can Be Optimized”) explains

A particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation.

(emphasis added)

Applicants recognized that the recited limitations, including that “a lateral width of the submount along the front part of the submount is 400 μm or more but 700 μm or less,” are of particular benefit. *See, e.g.*, paragraph [0042] of the publication corresponding to this application. In contrast, the cited art provides no evidence that it was recognized within the art at the time of invention that “a lateral width of the submount along the front part of the submount” was a “result-effective variable.” For example, Komoto, paragraph [0022] explains that relative distance X1, shown in FIG. 1A, might be adjusted to “improve[] the degree of freedom of design.” However, Komoto is silent as to any benefit associated with adjusting “a lateral width of the submount along the front part of the submount.” Given the need for a conventional device to provide adequate space for reliable wire bonding at the sides of the two-beam laser element, considerations as to the lateral width of the submount would have been biased towards a wider design – as reflected by the cited references – and not yield the claimed subject matter.

For at least the above reasons, the cited art fails to disclose or render obvious the subject matter recited in claim 1. Thus, Applicants respectfully request withdrawal of the rejections of independent claim 1, and claims 2, 3, and 5-7 which depend thereon.

Claim 5

Claim 5 recites:

The two-beam semiconductor laser device of claim 1,
further comprising a metal frame;
wherein the submount is mounted directly on the frame, and
no photodetector is directly mounted on the frame.

FIGS. 3-5 of this application illustrate a non-limiting embodiment of the above limitations. As discussed in paragraphs [0033]-[0035] of the publication corresponding to this application, in a conventional device:

... the two-beam semiconductor laser device 50 has the photodetector 66 arranged behind the two-beam semiconductor laser element LDC, and thus has four terminals.

This requires even longer wires to be used as the wires 67 to 69 bonded to the n-side common electrode 60 and the first and second electrode pads 64 and 65, and thus inconveniently causes the inductances thereof to vary unduly greatly.

Furthermore, the presence of the photodetector 66 makes it difficult to miniaturize the two-beam semiconductor laser device 50. Moreover, since the space behind the two-beam semiconductor laser element LDC is occupied by the photodetector 66, the wires 68 and 69 are connected to the first and second electrode pads 64 and 65 at the sides of the two-beam semiconductor laser element LDC. This makes the submount 63 unduly wide, which makes it more difficult to miniaturize the two-beam semiconductor laser device 50.

In contrast, in Komoto both substrate 6 (with laser element 3 thereon) and semiconductor substrate 4 (with a "light receiving element formed in the surface") are mounted directly on lead frame 1. See Komoto, paragraph [0028] ("The semiconductor laser element 3 and the semiconductor substrate 4 are adhered by heat onto this molded lead frame.").

Applicants respectfully submit that the cited art does not disclose or render obvious the further limitations recited in claim 5. Thus, Applicants respectfully request withdrawal of the rejection of claim 5.

In view of the foregoing remarks and accompanying declaration, Applicants respectfully submit that the instant application is in condition for allowance, and respectfully request the Examiner's favorable reconsideration as to allowance, and withdrawal of any rejections of the pending claims. If the Examiner believes a telephone conference would expedite prosecution of this application, please contact the Applicants' representative listed below.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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